Vol. 20, No. 7 JULY 1943

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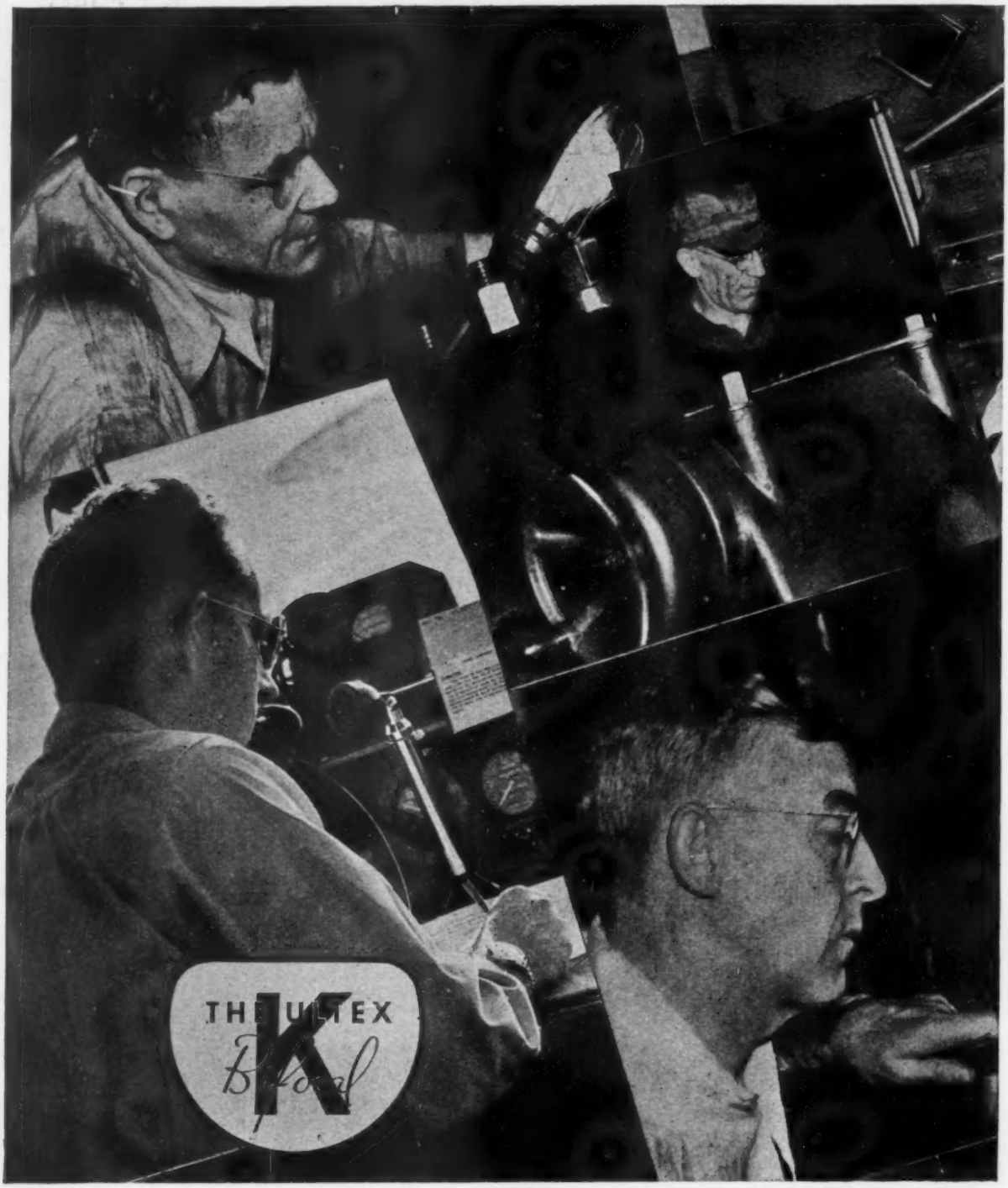
1501 Foshay Tower, 821 Marquette Ave., Minneapolis, 2, Minn.

ANNUAL SUBSCRIPTION $4.00 CANADA $4.50, FOREIGN $5.00
Single copies, 50c

Entered as second-class matter February 20, 1924, at the postoffice at Minneapolis 2, Minnesota under the Act of March 3, 1879.



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Publication Office: 1501-04 Foshay Tower, 821 Marquette Av., Minneapolis 2, Minn.

AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY

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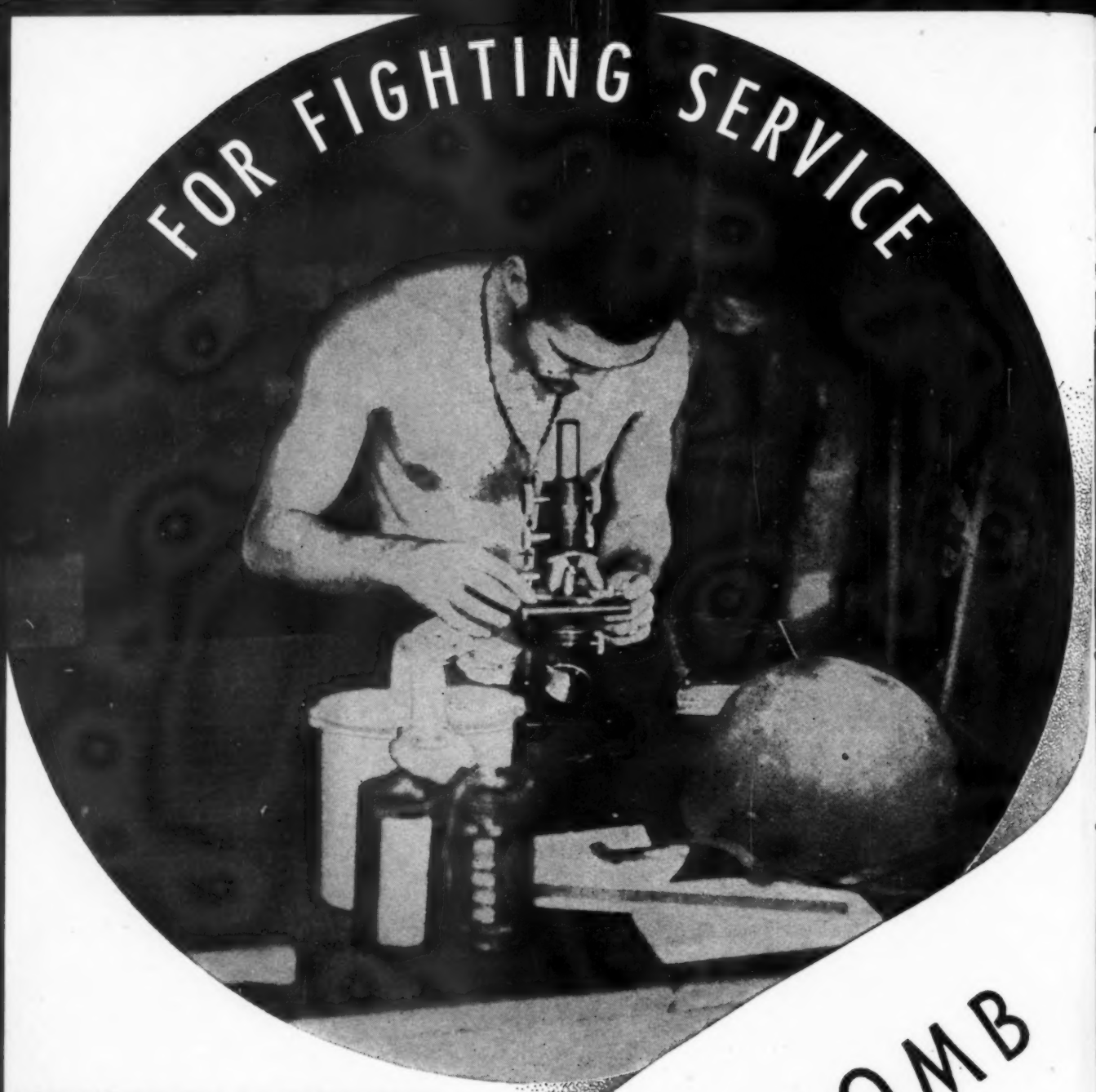

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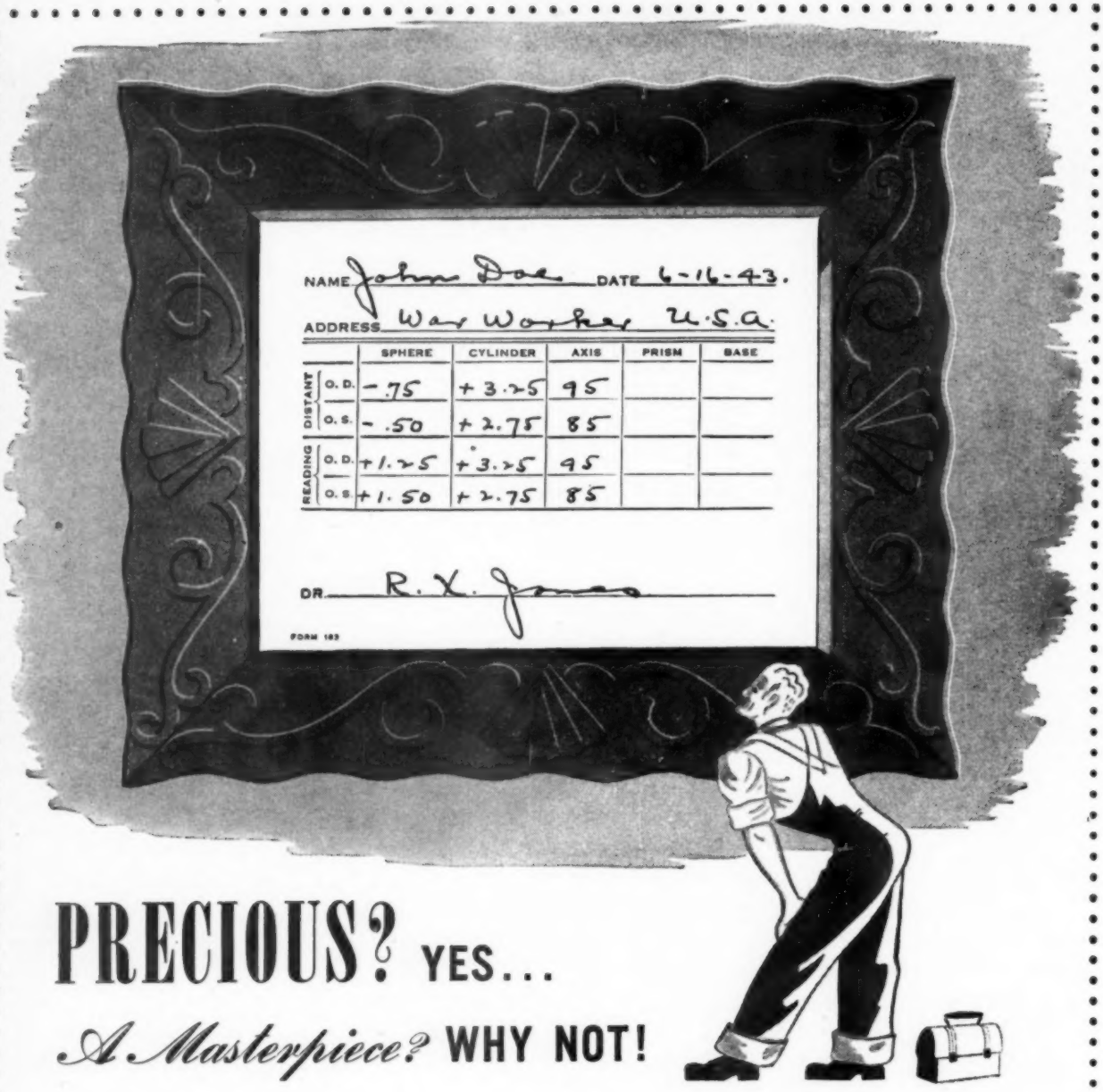
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Vol. 20 JULY, 1943 No. 7

PHOTOGRAPHY OF EYE MOVEMENTS*

Henry A. Imus, A.M.; John W. M. Rothney, Ed.D., and
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Introduction. The photography of eye-movements has been the subject of many investigations since the beginning of the century, when Dodge and Dearborn invented and improved the instrumentation and technique.[1] All of the early instruments required special laboratory arrangements and hence their use was somewhat restricted. The advent of a portable camera, however, has made possible the eye-movement photography of large groups of subjects. Such a new development requires careful evaluation of the data obtained before broad applications of the technique are attempted. For this reason we are giving the subject special attention here.

The Ophthalm-O-Graph.[2] This binocular camera has a movable film on which are recorded, by means of light reflected from the corneas of the eyes, the coordinated movements of the eyes which occur during the act of reading. From the film records, it is possible to obtain, by counting, the number of fixations or pauses in reading a line of print, the number of regressions or backward glances, and, since the film is moved by means of a constant speed motive, it is also possible to determine the rate of reading, which is usually reported in terms of words per minute. The subject is first required to read a practice card of the same size and approximately the same length as the test card. He is next required to read the test card, which contains exactly 50 words, and to answer a comprehension test composed of 10 true-false questions.

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[1] Taylor, E. A., *Controlled Reading*, Univ. of Chicago Press, Chicago, 1936.
[2] Distributed by the American Optical Company, Southbridge, Massachusetts.

* An abridgement of the material appearing in Chapter IV, An Evaluation of Visual Factors in Reading. Henry A. Imus, John W. M. Rothney and Robert M. Bear. Copyright 1938 Dartmouth College. Submitted on April 23, 1943, for publication in the July, 1943, issue of AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

We have previously described the measuring technique used in this study,[3] and we have also presented the reading material and the test questions.[4]

It is generally assumed that the photographic record of eye-movements produces a true picture, in an objective manner, of the actual reading habits of the subject. It is claimed that the records provide a means for diagnosing difficulty in reading and that groups may be selected for remedial treatment on the basis of such records. It is also claimed that remedial treatment will eradicate the reading difficulties discovered in this manner and hence improve academic performance.

Reliability. It is well known that any instrument which is to be used for diagnostic purposes should be highly reliable—that is, when the instrument is used consecutively on the same individual, the second or third administrations should result in a score closely approximating the first score obtained. In order to determine the reliability of the eye-movement camera record, we have computed the correlations between scores obtained by a group of our subjects on first and second, first and third, and second and third repetitions of the reading. The results are reported in Table I. It can be seen from this Table that the re-testing coefficients vary from 0.592 to 0.720. These figures are *not* high enough for the purpose of individual diagnosis.[5] If we take the lowest coefficient

TABLE I

Retesting Coefficients between First and Second, First and Third, and Second and Third Scores for Regressions, Fixations and Speed of Reading as Measured by the Eye-movement Camera.

	N	r^{12}	*P.E.**	r^{13}	P.E.	r^{23}	P.E.
Regressions	150	.603	4.1	.603	4.0	.592	4.1
Fixations	154	.646	8.2	.618	8.5	.720	7.5
Speed (Wds./Min.)	151	.594	48.8	.616	49.6	.623	49.2

[3] H. A. Imus, John W. Rothney and Robert M. Bear. Appendix A. Evaluation of the Dartmouth Visual Survey. pp. 5-20. An Evaluation of Visual Factors in Reading. Dartmouth College Publications. 1938.

[4] H. A. Imus, John M. Rothney and Robert M. Bear. Appendix A, Evaluation of Visual Factors in Reading. pp. 126. Dartmouth College Publications. 1938.

[5] Kelley, T. L., *Statistical Method*, Macmillan Co., 1924.

*Interpret the P.E. as follows: The value given for speed in this column indicates that an obtained speed score is as likely to vary from the individual's estimated true speed by an amount greater than 48.8 points as it is likely to vary by an amount less than that figure—that is, a score reported as 200 words per minute means only that the chances are even that the individual's true rate lies between 151.2 and 248.8 words per minute. Finer classification must wait for more reliable measurement.

(0.592), we find that the second performance in regressions on the eye-movement camera predicts third performance only 19 per cent better than could be done by pure chance. The third performance on fixation could be predicted from the second only 32 per cent better than chance. Our computations for the tests indicate that they should be approximately 5 times as long as they are now, if we are to secure a test with a reliability of 0.90—a minimum low for individual diagnosis and placement.[6] The same increase in length is needed for the regression and fixation measurements with slightly less length for the fixations. Since, however, all the records are read off the same film, it is desirable that the records, if they are to be of use in individual diagnosis, should be increased to a minimum of 250 words, and a record of 300 words would permit still greater accuracy. We have no hesitation in stating that before individual diagnosis of reading difficulty is made on the basis of eye-movement camera scores, the subject should be required to read 5 to 7 times as much material as he now reads.

Comprehension. Comprehension of reading on the eye-movement camera is presumed to be measured by means of ten statements covering the material read to which the subject responds by circling a "yes" or "no" to indicate the truth or falsity of the statement.[7]

TABLE II

Comparison of Eye-Movement Camera Comprehension Test Scores Made By Subjects of Dartmouth Visual Survey Before and After Reading Selection.

SCORE	PARAGRAPH					
	Louisiana		Amundsen		Jackson	
	2	9	16	—	4	25
	Before	After	Before	After	Before	After
100	N	N	N	N	N	N
90	10	28	37	—	7	42
80	17	26	45	8	17	20
70	27	26	34	16	25	15
60	22	19	15	18	22	7
50	14	1	5	12	7	2
40	5	1	4	16	10	2
30	2	2	1	6	6	—
20	1	—	—	—	2	—
N	100	112	76	157	100	113
M	66	76	56	78	64	84

[6] Using the Spearman-Brown prophecy formula.

[7] The paragraphs and accompanying statements are shown in Appendix A.

It is rather startling, at our present state of knowledge concerning the measurement of comprehension, to find "yes—no" questions used without correction for guessing. In order to determine the value of such a technique, we required students to answer the questions *before* they had read the paragraphs and then took the scores of students *after* they had read them for comparison. The distribution of scores follows in Table II. It appears from these figures that the comprehension score cannot be used as evidence that the subject understood what he had read, since he can do almost as well *before* as *after* he has read it. There may be significant differences between the means of these before and after groups, but the point that must be stressed is the distribution of scores. If, as in the Louisiana paragraph, 92 per cent of our subjects get scores of 50 per cent or better *before* they read the selection and 96 per cent get scores of 50 per cent *after* they read it, it is just impossible to tell whether or not the reading has measured comprehension. This simply means that it is possible to skim through so as to make a high speed score with few fixations and no regressions without paying attention to comprehension of the material read. The reason for the above finding may be found in the failure to correct for guessing, in using material which is known rather generally by college students, by generally inadequate knowledge of how to examine for comprehension, and in inadequate sampling, all of which has resulted in inexpert test construction.

Validity. Our next investigation concerned the extent to which eye-movement camera records were related to reading test scores and to the ability to make academic point scores at the end of the first year in col-

TABLE III

Intercorrelations* between Reading Test Records, Eye-movement Camera Records, Scholastic Aptitude Test Scores and Academic Point Scores of 456 Subjects of the Dartmouth Visual Survey.

	Iowa Test		Eye-movement Camera			S.A.T.
	Comp.	Speed	Speed	Fix.	Reg.	
Iowa Speed	.618					
Camera Speed	.315	.385				
Fixations	.379	.381	.800			
Regressions	.247	.300	.573	.728		
S.A.T.	.592	.389	.207	.266	.148	
Acad. Points	.398	.297	.134	.197	.073	.462

* Standard errors of the above coefficients may be obtained in the usual manner: $1 - r^2/\sqrt{N}$. The denominator of the above cases will be 21.35, so that simple mental arithmetic will bring results readily.

lege. The intercorrelations between these variables are reported in Tables III and IV which follow.

TABLE IV

A re-arrangement of Items in Table III, Above, Using Academic Point Score as a Criterion.*

	Acad. Points	Iowa Speed	Eye-movement Camera Speed	Fix.	Reg.	Iowa Comp.
Iowa Speed	.297					
Camera Speed	.134	.385				
Fixations	.197	.381	.800			
Regressions	.073	.300	.573	.728		
Iowa Comp.	.398	.618	.315	.379	.247	
S.A.T.	.462	.389	.207	.266	.148	.592

In Table III, we find that the speed of reading as measured by the eye-movement camera, the number of fixations and the number of regressions are correlated with ability in reading as measured by the Iowa comprehension test to the extent indicated by coefficients of only 0.315, 0.379 and 0.247 respectively. These figures represent forecasting efficiencies[8] in predicting comprehension as measured by the Iowa Test of Silent Reading of only 5 per cent, 8 per cent and 3 per cent respectively over what could be done by guessing. Since the reliability of the Iowa comprehension score is high, we can be sure that the low forecasting efficiencies are not due to the unreliability of this test as a criterion. In setting up a battery for the prediction of reading achievement, speed, number of fixations and number of regressions as measured by the eye-movement camera would constitute only 9 per cent, 16 per cent and 6 per cent respectively of a perfect battery for the prediction of reading ability, when the criterion of such is the comprehension score on the Iowa Test of Silent Reading.[9] When eye-movement camera speed, fixation and regression scores are combined in the best possible manner with Iowa speed score, scholastic aptitude test score and academic point score to predict ability in reading as measured by the Iowa comprehension

* Corrections for attenuation of the above coefficients may be made by using the reliability coefficients in Table I for the camera figures, those reported in the Manual for the Iowa Comprehension and Speed scores and estimated coefficients of .70 and .80+ for the academic points and scholastic aptitude scores.

[8] Correlation coefficients too often are not considered in terms of their forecasting efficiency, so that their significance is over-emphasized. For example, a coefficient of correlation between two variables of 0.6 has a forecasting efficiency of only 20 per cent.

[9] In using these figures, we realize that an Iowa Test of Silent Reading comprehension score is *not* a perfect measure of reading ability. It is, however, as valid as most tests of ability in reading at the level at which it is used.

test, the multiple R obtained is 0.731 which has a forecasting efficiency of only 30 per cent.

From the figures secured in the computation of the multiple R, we have set up weights for a regression equation for the prediction of reading ability as measured by the Iowa Test of Silent Reading comprehension score. The regression weights obtained follow:

*Iowa Speed	0.39	S.A.T. Score	0.36
Academic Point Score	0.08	Regressions	—0.03
Fixations	0.17	Camera Speed	0.03

The small weights which are to be attached to the eye-movement camera scores indicate that any claim which is made concerning its diagnostic value must be followed by a statement that the diagnosis is likely to be highly unreliable since the presence of difficulties in reading presumed to be measured by the eye-movement camera are not potent factors in determining the effectiveness of the process of reading as measured by the Iowa test.

In order to determine the effectiveness of the eye-movement camera in predicting academic point score (since the *raison d'etre* of diagnostic and remedial programs in reading is usually that of improving academic performance), we have rearranged the correlation coefficients reported in Table III to the order reported in Table IV, with academic point score as the criterion of academic achievement. We are aware of the complexity of factors[10] which go to make up academic point scores, and we are aware of the fact that academic point scores are probably not the best measure of academic achievement. We are aware, too, that our criterion is made up of a composite of marks obtained on subject-fields, some of which do not require a great deal of reading. We cannot, however, escape the fact that, by and large, reading ability is a potent factor in determining academic achievement[11] (note that we maintain this point even though the correlation between academic point score and Iowa Test comprehension score is only 0.398) whether or not the student makes high scores on the tests and in other artificial situations to which we subject him.

---

* *It should be noted that these weights apply only in the combinations in which they are used here. For example, if Iowa speed score has been obtained, the value obtained from the addition of the eye-movement camera speed score is negligible.*

[10] Among the factors, other than ability, which affect academic point scores are industry, drive, special interest, rapport with instructors, fortunate sampling of examination questions and general feeling of well being, etc.

[11] Reports which indicate that college students can read at only the fourth grade level are, in our opinion, not sound. People who make such claims might try administering the scholastic aptitude test to a child having average ability in reading at the level of the fourth grade. A better interpretation of the statement that college students read at the fourth grade level is that they read with no better efficiency or comprehension the material of their own level than do the fourth grade children in reading material of the fourth grade level.

In view of all the above, we cannot expect that any one measure is likely to be effective in predicting academic success. (In fact, no combination of measures has yet been found which predicts academic success with a high degree of accuracy). It is not surprising, therefore, to find that the three eye-movement camera records predict academic success to the extent of less than one per cent greater than could be done by throwing dice. It is important that the figures given above be kept in mind because the implication in so much of the eye-movement camera work is that there is a relationship between academic achievement and eye-movement camera score.[12] Let us point out very definitely here that for our subjects the eye-movement camera tells so little more about academic grades or reading ability as measured by the Iowa Test of Silent Reading than can be obtained from sorting students by the drawing of lots, that the taking of eye-movement camera records to determine reading ability is not worth the effort involved.[13]

In order to bring the point stated above into clearer focus, we have computed regression weights from the correlation coefficients in Table III for the prediction of academic performance. The weights follow:

*Iowa Speed	—0.14	Iowa Comprehension	0.51
S.A.T. Score	0.34	Regressions	—0.08
Fixations	0.20	Camera Speed	—0.16

The multiple R obtained is 0.581, which indicates a forecasting effi-

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* *Observe footnote under previous distribution of weights.*

[12] The implications are often very subtle. They suggest that before a boy is separated from school, he should be measured with the eye-movement camera to see if any difficulty can be found. They also suggest that children be grouped by eye-movement camera scores and so lessen failure in high school and college. The fact that eye-movement photographs are often presented together with the statement that the child is failing in school implies a causal relationship between the two factors.

[13] Mrs. Florence C. Rose, Assistant in Education at Smith College, conducted a series of tests on 194 students who made low scores on the ophthalmographic record, namely, below 276 words per minute, more than 100 fixations per 100 words, or more than 20 regressions per 100 words. She reported the following correlation coefficients: (1) between reading speed in words per minute on the ophthalmographic records and

(a) rate scores on the Iowa Test of Silent Reading—0.05,
(b) comprehension scores of same test, 0.12,
(c) Minnesota speed of Reading Test, 0.008,
(d) verbal section of the Scholastic Aptitude Test of College Entrance Examination Board, 0.24;

(2) between number of fixations on the ophthalmographic records and

(a) comprehension scores of Iowa Test of Silent Reading—0.004, and
(b) Minnesota speed of Reading Test, 0.007.

It must be emphasized again here that even the highest correlation coefficient, 0.24, is useless for purposes of prediction of reading test performance.

ciency of this combination of measures of only 20 per cent in predicting academic achievement.

In view of the size of the weights and forecasting efficiencies presented here, it is advisable again to emphasize the caution given above concerning the interpretation of eye-movement camera scores in considering academic success.

Relationship between Test Scores. There are other interesting correlation coefficients in the two Tables of coefficients of correlation in addition to those given above. It is interesting to note, for example, that the correlation between speed as measured by the Iowa Test of Silent Reading is related to eye-movement camera speed only to the extent indicated by the correlation coefficient of 0.385; that Iowa speed is correlated with Iowa comprehension to the extent of 0.618 and that Iowa comprehension is related to academic points to the extent of the coefficient 0.398; note also that both eye-movement camera and Iowa speed scores are not highly correlated with academic point scores (0.134 and 0.297 respectively). These findings indicate, of course, that speed of reading as measured in this study is not closely related to academic performance. When due consideration is given to all these factors plus those presented above, one must question seriously the value of any reading program which is designed to increase speed of reading, as measured by the eye-movement camera or other tests of reading, *so that* it will improve achievement in college.

TABLE V.

Mean Scholastic Aptitude Test Scores, Iowa Silent Reading Test Scores, Eye-movement Camera Performance and Academic Point Scores on Subjects of the Dartmouth Visual Survey, Grouped by Number of Regressions Made on Eye-movement Camera Record.

Eye-movement Camera	N	S.A.T.	Iowa Test (B)		Eye-movement Camera		Academic Points	
Reg./100 Wds.			Comp.	Wds./Min.	Fix./100 Wds.	Wds./ Min.	Mid-year	Final
40-44	4	207.0	143.2	189.5	117.0	227.0	25.8	54.5
35-39	7	204.5	142.6	187.4	110.2	215.9	28.4	58.8
30-34	12	193.7	142.0	185.3	99.5	242.8	25.4	52.0
25-29	21	203.1	131.2	183.5	98.8	261.6	25.6	52.1
20-24	78	218.5	147.0	212.2	90.7	279.6	28.6	56.9
15-19	83	229.7	155.0	220.3	81.2	309.6	31.1	64.0
10-14	211	221.2	153.6	229.4	74.6	346.1	29.9	61.1
5- 9	143	230.3	158.0	236.6	65.4	393.9	37.0	63.0
0- 4	75	229.3	163.6	251.0	59.8	427.7	31.6	62.9

Note: In every case, except that of academic points, the score given is that of the fall testing

Although the correlation coefficients reported in previous pages tell us of the relationship existing between the variables, we have chosen to present, in addition, the data in the form in which they are presented in Tables V and VI. By so doing, we show the frequency of regressions and the characteristics of the groups so classified. We have not computed all the differences between the groups and their significance, since it did not seem that such computations would add sufficiently to the findings reported above. The reader will note the irregularity of the various test score means as a contrast to the regularity of the regression groupings. Note particularly the last four means in the last column of Table V where a difference of only 3.9 academic points divides the groups separated by 15 points on the scale of regressions on the eye-movement camera and does not even separate them regularly. Note the sixth column, last row, of Table V, in which 83 students who make more regressions than the average have higher academic point scores than those who make less than the average number of regressions. Note also that these are the students of high scholastic aptitude, and we may safely interpret these findings to mean that students of high scholastic aptitude make more regressions, as measured by the eye-movement camera, as well as higher academic point scores. The interpretation that better students regress oftener so that they can read more carefully is, at least, worth consideration. These and other findings have been reported[14] and suggest that regressions *per se* are not undesirable. Consideration, however, of the size of the re-testing coefficients reported above will show how tenuous are all these arguments.

Relations between Eye-movement Camera Scores. The relationship between number of fixations and other measurements of efficiency in reading may be observed first by abstracting six of the coefficients of correlation from Table IV. These six coefficients of correlation are between the number of fixations and (1) words per minute on the eye-movement camera 0.800; (2) number of regressions 0.728; (3) words per minute of Iowa Test 0.381; (4) comprehension on Iowa Test 0.379; (5) score on scholastic aptitude test 0.266 and (6) academic point score 0.197.

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[14] Henry A. Imus, John W. M. Rothney and Robert M. Bear. Results of the Dartmouth Visual Survey. pp. 21-61. An Evaluation of Visual Factors in Reading. Dartmouth College Publications. 1938.

TABLE VI.

Mean Scholastic Aptitude Test Scores, Iowa Silent Reading Test Scores, Eye-movement Camera Performance and Academic Point Scores of Subjects of the Dartmouth Visual Survey, Grouped by Number of Fixations Made on Eye-movement Camera Record.

Eye-movement Camera Fix./100 Wds.	N	S.A.T.	Iowa Test (B)		Eye-movement Camera		Academic Point	
			Comp.	Wds./Min.	Reg./100 Wds.	Wds./ Min.	Mid-year	Final
130-139	4	214.5	139.5	189.5	33.2	172.0	30.8	69.5
120-129	5	152.5	108.0	208.5	35.0	206.5	23.0	48.5
110-119	8	203.3	139.5	225.8	24.5	213.3	25.2	53.3
100-109	31	203.2	135.9	188.7	23.8	228.7	22.5	46.4
90-99	69	214.1	146.4	209.0	20.6	266.8	28.2	57.4
80-89	116	212.6	147.2	216.0	15.4	299.5	28.6	58.1
70-79	159	222.6	152.8	223.9	11.6	340.3	31.1	62.4
60-69	147	232.8	160.5	236.4	9.3	383.1	32.2	64.5
50-59	76	240.8	167.6	257.8	5.8	462.3	31.8	62.7
40-49	19	250.8	171.4	275.0	5.2	554.0	38.0	76.6

The correlation of 0.800 between number of fixations and speed on the eye-movement camera is reflected in Table VI, where there is shown a marked tendency for the number of words read per minute to increase directly with the decrease in number of fixations. The finding of this close relationship should be expected because any increase in the number of fixations per hundred words must decrease the speed of reading simply because each fixation consumes a certain amount of time. In fact, there would be a more nearly perfect relationship were it not for the fact that the length of the fixation varies from one individual to another.

The number of fixations per hundred words is correlated with the number of regressions per hundred words to the extent indicated by the coefficient of 0.728. This is also indicated by the column of regressions in Table VI where there is a gradual decrease in the number of regressions as the number of fixations decreases. Again these results are to be expected since a regression is counted as another fixation. It should be pointed out that the use of the terms "fixations" and "regressions" implies that they are separate entities, whereas they must be related since all regressions are fixations. This fact is often overlooked when three separate scores are given in reports of performance on the eye-movement camera.

When we examine the relationships between the number of fixations and scores which are not necessarily related to them, as described above, we find that the coefficients obtained are less by 0.30 to 0.50 than when intercorrelations between eye-movement camera scores are obtained. For

example, the coefficient of correlation between the number of fixations and the score for speed on the Iowa Test is only 0.381, which is not high enough to enable us to select rapid readers, as measured by the Iowa Test, on the basis of the number of fixations per hundred words on the eye-movement camera. It will be observed, however, in Table VI that the extremely rapid readers, as measured by the Iowa Test, make many less fixations per hundred words on the eye-movement camera than the slow readers. Apparently rapid reading on the Iowa Test involves factors other than number of fixations to a much greater degree than on the record obtained on the eye-movement camera.

The relationship between the number of fixations per hundred words and comprehension scores on the Iowa Test, the scholastic aptitude test and academic points are 0.379, 0.266 and 0.197 respectively. These coefficients indicate that the number of fixations, as measured by the eye-movement camera, do not differentiate groups on these three tests. They certainly cannot be used as indicators of the type of achievement which these tests measure. It can be observed from Table VI, however, that those who make the fewest fixations per hundred words on the eye-movement camera are the brighter students, the better readers as measured by the Iowa Test and make better academic point scores. At this point, it must be noted that the above statement does not apply over the whole range of abilities in this freshman class because this close relationship exists only at the higher levels of performance and ability.

Clinical Appraisal of the Eye-movement Camera. We have presented some rather convincing evidence concerning the lack of reliability and validity of the eye-movement camera procedure. The following section includes a report of an attempt to use it as a diagnostic instrument in The Eye Clinic. The statements presented herewith were written by a clinician[15] from the regular staff before the study of the reliability and validity reported above was made. It may, therefore, be considered as an independent and clinical, rather than statistical, appraisal of the instrument.

"A comparison of two or more records which were taken on the eye-movement camera with 25 subjects, selected at random, is presented. Some of these subjects were regular patients at The Eye Clinic; others were college students, having no ocular complaints or difficulty in read-

[15] Robert E. Bannon, Research Clinician in Physiological Optics, The Eye Clinic of The Dartmouth Eye Institute.

ing, and the rest were college professors, instructors, assistants or children.

"The usual technique was followed in photographing the eye-movements with the eye-movement camera. Pictures were taken within a half-hour interval. The subjects were not informed of their scores on the comprehension tests nor of the purpose of the subsequent tests. No other subjects were in the room at the time of the photography.

"In Table VII are presented the data from records taken under similar conditions except that different test cards were used. These data are shown in the order that the records were taken, rather than regrouping according to some criterion such as age or grade level. The capital letter in the second column, under 'Card,' refers to the particular test card read. For example, A, B, D, J and K indicate different cards of college level and HS indicates a card of high school level. In columns 3, 4 and 5, 'C' indicates performance rated as of college level, 'HS' of high school level and the Roman numerals indicate the various grade levels.[16]

TABLE VII

Data of Repeated Tests on the Eye-movement Camera for the Various Subjects, showing the Card Read, Number of Fixations and Regressions per 100 Words, the Speed in Words per Minute and the Comprehension Score in Per Cent, Together with the Grade Level for Each Score*

Subject	Card Read	Fixations		Regressions		Speed		Comp.
		Score	Grade	Score	Grade	Score	Grade	Percent
W.W.	A	118	III	20	VI	142	III	90
	B	94	H.S.	24	V	203	VI	90
M.B.	A	80	C	4	C	286	C	70
	B	76	C	4	C	316	C	90
H.C.	B	92	H.S.	8	C	240	H.S.	90
	A	92	H.S.	12	C	218	VI	80
J.R.	H.S.	108	IV	24	V	176	V	10
	H.S.	130	III	32	IV	120	III	50
P.W.	B	70	C	8	C	400	C	80
	A	58	C	0	C	500	C	80
C.C.	A	120	III	48	II	188	V	70
	B	96	VI	18	VI	214	VI	100
R.I.	B	56	C	0	C	400	C	100
	A	68	C	2	C	334	C	100
K.J.	A	62	C	6	C	353	C	60

* Different cards used on each retest.

[16] Refer to "norms" listed in the "Manual for Controlled Reading," American Optical Company, Southbridge, Massachusetts, 1937.

Subject	Card Read	Fixations		Regressions		Speed		Comp.
		Score	Grade	Score	Grade	Score	Grade	Percent
	B	60	C	6	C	387	C	90
J.N.	A	98	VI	16	H.S.	273	H.S.	50
	B	104	IV	16	H.S.	261	H.S.	90
P.H.	A	44	C	2	C	666	C	80
	B	54	C	4	C	510	C	60
	H.S.	58	C	8	C	490	C	50
L.B.	D	114	III-IV	20	VI	200	V-VI	20
	B	74	C	4	C	340	C	80
J.M.	D	72	C	6	C	334	C	60
	B	74	C	6	C	261	H.S.	90
W.C.	A	56	C	6	C	364	C	70
	B	52	C	2	C	381	C	90
C.G.	A	74	C	8	C	353	C	70
	B	82	C	12	C	375	C	90
	D	92	H.S.	12	C	282	H.S.	70
G.W.	B	98	VI	26	IV-V	300	H.S.	70
	K	80	C	18	H.S.	324	C	40
R.C.	B	96	VI-VII	14	H.S.	199	V-VI	100
	A	134	III	22	V	127	III	90
A.M.(1)	B	86	H.S-C.	10	C	208	V-VI	90
	K	96	VII	18	H.S.	185	V	80
A.M.(2)	D	74	C	4	C	286	H.S.	90
	K	92	H.S.	16	H.S.	234	VII	80
	A	64	C	8	C	289	H.S.	70
W.J.	J	120	III	28	IV	171	IV	90
	K	130	III	34	IV	138	III	100
R.W.	B	86	C	8	C	545	C	30
	D	60	C	8	C	414	C	30
D.B.	D	68	C	18	H.S.	312	C	90
	K	78	C	24	V	286	H.S.	70
W.W.	A	88	H.S.	12	C	334	C	80
	B	84	C	8	C	334	C	100
L.G.(1)	B	74	C	18	VII-H.S.	296	H.S.	100
	A	90	H.S.	20	VI	226	VII	90
L.G.(2)	D	60	C	12	C	334	C	90
	J	70	C	14	H.S.	312	C	90
J.W.	B	38	C+	0	C+	750	C+	60
	A	80	C	16	H.S.	267	H.S.	90

"The foregoing Table presents some rather consistent readings, but in nearly an equal number of cases there is considerable variation between the first and second reading. There are definite indications that we should not rely upon one picture alone in order to determine the true reading ability of an individual.

"In Table VIII, which follows, are presented a few cases in which

the same card was read twice (or more times) and none of the conditions were varied. The subject was not informed that he would be given the same card a second time nor was he informed of the purpose of the test. It was rather expected that, given a second chance at the same card, a marked improvement would be evident. These films, however, did not show any greater variability than other records obtained when 'different cards were read.'

TABLE VIII

Data of Repeated Tests on the Eye-movement Camera for the Various Subjects Showing the Card Read, Number of Fixations and Regressions per 100 Words, the Speed in Words per Minute and the Comprehension Score in Per Cent, Together with the Grade Level for Each Score*

Subject	Card Read	Fixations		Regressions		Speed		Comp.
		Score	Grade	Score	Grade	Score	Grade	Percent
W.W.	A	118	III	20	VI	142	III	90
	A	96	VI-VII	32	IV	205	VI	—
G.K.(1)	A	102	V	30	IV	208	VI	90
	A	92	H.S.	20	VI	242	VII	100
G.K.(2)	B	84	C	16	H.S.	245	VII-H.S.	100
	B	56	C	8	C	337	C	100
H.B.	A	84	C	12	C	245	VII-H.S.	80
	A	84	C	14	H.S.	324	C	90
J.N.	A	98	VI	16	H.S.	273	H.S.	90
	A	100	V	18	H.S.	231	VII	80
P.H.(1)	A	44	C	2	C	666	C	80
	A	48	C	2	C	562	C	90
P.H.(2)	B	54	C	4	C	510	C	60
	B	60	C	6	C	444	C	70
V.B.	A	74	C	10	C	316	C	80
	A	62	C	8	C	340	C	100
	A	64	C	10	C	375	C	100
	A	68	C	8	C	316	C	100
	A	64	C	4	C	400	C	100
	A	54	C	0	C	461	C	100

"In the case of subject 'V.B.' who read the same card six times, there was, of course, a gradual improvement. It is to be noted that, although the speed of 'V.B.' varied from 316 to 461 words per minute while reading the same card at ten minute intervals, the same and even greater variability is shown by some subjects who read different cards with the same time intervals, viz., cases of 'P.H.,' 'L.W.B.,' and 'J.M.W.'

"Table IX, which follows, presents a comparison between two boys of the same chronological age and in the same grades in different schools. Subject 'D.M.' has been classed by competent authorities as a poor reader,

*Same cards used on each retest.

and it was because of his reading disability that he was sent here. On the other hand, the second subject, 'J.L.B.' has not been classed as a poor reader and has no complaints relative to the use of his eyes or about his reading ability. It was supposed that, by having 'J.L.B.' read the college cards, the data would show him to be a relatively slow reader."

Clinician's Observations and Conclusions. "While this study is by no means exhaustive, it is fairly evident from these repeated pictures that an individual does vary in his eye-movement camera performance on successive tests. This is important in that, if a person varies from fifth grade level to college level merely by taking another picture, we must be skeptical when (after remedial reading training or lenses have been prescribed) the eye-movement camera record indicates that the patient's reading ability has been improved. If, a second or a third picture were taken, before the remedial training or lenses were given, it might conceivably show just as much apparent improvement relative to the first picture as has been shown in some instances after a period of training or after corrective lenses have been worn.

"It is the intention of this short discussion to show that, by the realization of the possibility of variation in a person's reading, it will be possible to judge better the value of different techniques and optical corrections insofar as they may affect reading skill.

"One suggestion regarding the better determination of a subject's status as a reader is that at least three pictures be taken under the same conditions with different, equally difficult cards and an average of these three pictures be taken to compare later with the average of another series of three pictures taken after the remedial training or the wearing of the correction.

"It is also felt that the range of variance of good readers is greater than that of poor readers, although not enough repeated pictures of poor readers were taken to substantiate this theory.

"Another observation in taking eye-movement camera pictures is that some subjects reported that they were forced to read faster because of the hum of the motor—they felt they had to read fast to keep up with the speed of the motor—others, and mainly poor readers, mentioned that the hum of the motor annoyed them so much that they had to retard their speed. It would, therefore, be interesting to compare data on a noiseless machine (if such is available) and one that hums.

"No doubt, a factor of some importance is the technique of the

TABLE IX

Repeated Tests on the Eye-movement Camera, Using Two Subjects in the VI Grade of School, Showing the Card Read, Number of Fixations and Regressions per 100 Words, Speed in Words per Minute and Comprehension in Per Cent, Together with the Grade Level for Each Score.

Subject	Age	Rx	Card Read	Fixations		Regressions		Speed		Comp.
				Score	Grade	Score	Grade	Score	Grade	Percent
D.M.*	12	None	"America" Grade 6-7	196	I+	40	III	108	II	75
		None	"Bloodhounds" Grade 5	246	I—	46	II	84	II	100
		None	"Collies" Grade V	206	I+	62	I—	102	II	100
		+1.50 O.U.	"Fire-crackers" Grade 6-7	240	I—	76	I—	94	II	100
J.B.	12	None	"Fire-crackers" Grade 6-7	88	H.S.	12	C	353	C	83
		None	College A	92	H.S.	18	H.S.	264	H.S.	80
		None	College B	100	V	22	V	247	H.S.	100
		None	College J	114	III	40	III	232	VII	90
		None	College K	128	III	38	III	192	V	80
		None	College D	98	VI	18	H.S.	247	H.S.	100
		None	"America" Grade 6-7	96	VII	24	V	286	H.S.	100
		None	"Glass" Grade H.S.	116	III	24	V	208	VI	83

*All four pictures show increase in left hyperphoria as subject reads.

operator. One who speaks rapidly and sharply is apt to encourage the reader to do better than he would if the operator spoke slowly and softly. This factor would be important on records that are to be compared closely.

"It has been suggested, no doubt, that a longer passage to read —21 lines instead of 7—would give a better indication of one's reading ability, but it is thought that three trials on 7-line cards would be better than one trial on a 21-line card because, if the person is apt to be variable, it might show up on the three trials, whereas on the one attempt it might not.

"Attention is called once more to the quite consistently poor showing of subject 'D.M.' on the four cards he read. This subject is definitely a poor reader, whereas the majority of other subjects presented are average or good readers. If it can be proved that really poor readers are consistently poor while a fairly good reader may vary from 'only average' to 'exceedingly good,' a point in the diagnosing of reading ability may be made more sure, even though it may necessitate the taking of more than one photograph."

Summary. It is probable that the eye-movement camera may be a useful instrument, that it may be one used successfully for other age and grade levels than those used in our study, that it can be improved and that it furnishes an objective record which may be of some use other than the prediction of reading performance. It must be stated with considerable emphasis, however, that for our group it is unreliable, that it is not a valid measure of ability in reading if we use tests of reading as criteria, that the scores obtained from it are not closely related to the academic achievement of our subjects, that it cannot be used for individual diagnosis and, therefore, it cannot be used for differentiation of groups for the purpose of administering instruction in remedial reading.

We have made several constructive criticisms to conclude this very negative report. Among them are included, first, the increase of the length of the selection read from 5 to 7 times that of the present selection; the more adequate measurement of comprehension by better tests; the selection of material from other sources than the kind now used; some attempt to remove the artificiality of the situation for reading (or presentation of evidence that the situation in the eye-movement camera is closely related to that in the usual situation for reading) and adequate reporting of data from which normative material is prepared.

NOTES ON FUNDUS PATHOLOGIES IN ARMY HOSPITAL*

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Practice in the eye clinic of an Army General Hospital has afforded this writer the opportunity of making a statistical study of the cases treated. The statistics derived from an analysis of the clinics files and a review of the more significant case histories is felt to be of particular importance to the profession as a whole.

The case histories reviewed cover a period of about eight months. Ophthalmological examinations were given to 1,355 patients by the optometrist detailed to the clinic. The technique included a detailed media and fundus examination under cycloplegia. During the six day week, the average number of ophthalmoscopic examinations was 7 per day, or 14 eyes daily.

Clinical pictures and diagnoses were made first by the optometrist. After consultation, they were corroborated by the medical officer in charge who prescribed the necessary treatment.

The majority of retinitis cases were not of significance as they were mild degenerations. Only 5 of the total cases studied revealed defective vision in either eye. This is only .36% of the total, a relatively low figure.

There were three cases of arteriosclerosis. The three patients were soldiers past 55 years of age and the eye condition in each case was incidental to the general picture.

A statistical analysis of the cases studied is shown in the accompanying table.

The case histories follow:

Retinal Degeneration:

Numerous cases present small (yellowish-white) punctate areas about the macula. These are more evidenced when viewed under cycloplegia. We have had to term them as unclassified retinitis, but they are more like mild forms of punctate retinitis, although they have occurred in young male adults. On record are 18 of this type case. Vision was unaffected in all cases.

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*Submitted on May 19, 1943, for publication in The July, 1943, issue of The American Journal of Optometry and Archives of American Academy of Optometry.

STATISTICS

Cases examined	1,355	Retinitis	3
Fundus pathology	38	Chorio-retinitis	3
Per cent	2.71%	Choroiditis	5
Punctate retinitis	18	Choroidal Rupture	1
Macular Degeneration (mod.)	4	Papillitis	1
Arteriosclerosis	3	TOTAL	38

Photoretinitis:

Gun commander, aet 29.

History: Since observing sun through barrel of cannon (bore sighting), patient noticed decrease in v.a. and irregular shaped objects viewed with the left eye, all in one week's time. V.A. left 20/200.

Ophthalmoscopy: Moth eaten appearance of the retina around the macula region, moderately severe. Diagnosis of acute photic retinitis was made.

Disposition: Use of sun glasses, rest, periodic check.

Papillitis:

Cook, aet 24.

History: Patient reported blurred vision, right, following injury to the head 9 days prior to the examination. V.A., right F @ 4'.

Ophthalmoscopy: O.D. Engorgement of disc (choked disc) nerve head enlarged, whitish striae on papilla, veins engorged and slightly tortous, congestion of veins, arteries small. Large cotton patches on temporal side of disc. Upper nasal side of the disc shows slight hemorrhagic area. O.S. normal. Fields show large central scotoma, right. Diagnosis: Acute papillitis.

A month and a half later vision improved to 20/25, still moderate engorgement of the disc. White patches inferior and temporal to the disc. Scotoma still present, diagnosis was now changed to chronic papillitis.

Two months later the vision reduced to 20/50, scotoma moderately enlarged-positive. Fundus shows numerous patchy areas giving moth eaten appearance centrally, macula degeneration, disc suggestive of primary optic nerve atrophy.

Treatment throughout was atropine, sun glasses, and complete rest.

Chorioretinitis and Choroidal Rupture:

Marksman, aet 21.

History: 45 cal. bullet entered left side of face six weeks prior to examination. Vision in the left eye appears dim, wavy, uneven and contorted. V.A., left 20/300.

Clinical picture: Externally 6'' scar on left side of face. Eyegrounds showed a chorio-retinitis temporally. Retinal tear superiorly shows pigment deeming the diagnosis of choroidal rupture. Two months later vision was improved to 20/100, clinical picture remained the same. Fields studies revealed scotoma which corresponded to the fundus picture.

Summary:

1. Out of 1,355 cases, 38 or 2.71% show fundus pathology.
2. Most of the severe cases were the result of accident.

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AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY

Established 1924

Vol. 20 JULY, 1943 No. 7

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Annual Subscription, $4.00 in Advance; Canada, $4.50; Foreign, $5.00;
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Published Monthly by the
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ACTION NOW REQUIRED ON ARMY DISCRIMINATION AGAINST OPTOMETRISTS

As these lines are written our United States of America is entering the eighteenth month of World War II. During these months and the many which preceded them, our officials were engaged in the mighty task of organizing and welding together a fighting force of men with which to win this war. Men from all ranks of life were called to the colors, and as was proper, optometrists were asked to lay aside their professional duties and join forces with their fellow citizens to crush the Axis powers.

In this optometrists were found ready. Like the members of other professions, optometrists were willing to answer the call of their country

and gladly entered the service, but unlike members of most professions, they found themselves forced to serve under unwelcome and arbitrary regulations administered by a small group of "medical-politicians" who had seized control of the health services of the United States Army.

This unbelievable situation not only existed at the start of the war, but still exists. Optometrists find themselves in medical units and in many instances attached to eye departments, and in these departments are called upon to perform their true duties as refractionists, but are not accorded the rank of privilege usually accompanying professional work in the services.

In other words, while optometrists are detailed to examine and refract the eyes of the men in service, they are forced by means of medical trickery to do so as underlings, frequently serving under medical officers who know little or nothing about ocular refraction.

That this unfair situation should continue to exist is unthinkable. As well-qualified professional men, these optometrists in our Army should be accorded the same privilege and rank as is now accorded other professionals serving their country.

Before suggesting a course of procedure and a remedy for this unjust action, the writer would like to quote from a letter just received from an optometrist now serving with a medical unit in England. It is one of many received from our readers abroad, and illustrates, as well as can be reviewed in a letter, the present position of the optometrist in the United States Army. This writer was given the grade of Staff Sergeant, and works under medical officers who, while friendly to him and to optometry, dare not permit him to exercise the full perogatives of his professional training because of the position taken by the medical-politicians already mentioned. Because of his connections in the Army, we will not mention the name of this Pacific Coast optometrist. He is, however, quite well known in the west, and is an outstanding graduate of the Los Angeles School of Optometry.

> "After reading the Journal for the past few months I decided it was about time I drop you men a line and let you know how this California optometrist is doing here in ETO along with three other optometrists scattered in GH.S.
>
> "I was with the Michigan Medical unit, which is achieving national fame, last year and due to the fact that the eye clinic was not started I was transferred here where business is good. Here I have met Brigadier, if you please, Duke-Elder, ace-politician! Major (Lord) Lister, Parsons, Colonel Derrick T. Vail, ex-pres. of the ophthalmologists in U.S.A., present consultant in ophthalmology over here, and many others. Last month the Captain I worked for had an article sponsored by Duke Elder in the British Medical Association Journal on the effect of a

certain sulfa drug to mucous membrane of the eyes. Our Captain was educated in Scotland and has had the opportunity of knowing most of these men personally but he is not an eye man. Has never questioned my work, his best friends being optometrists in New York, and he fully knows our educational standards, and was more than glad to get me here. He knows that I know my work and has given me complete charge of the work. I have made a good reputation for myself and the other day got a patient referred all the way from London. That was very interesting. It happened to be an easy case, just a question of a good retinoscopy.

"All refracting here, of course, is by appointment . . . perimetric tests taken by the two Corporals, I do the refracting, not even visual acuity. I am treated nicely (professionally speaking), furlough once every five weeks, and have seen and met many refracting opticians throughout the Isles and am well known at the RCA in London and incidentally well treated there. Being there are only about four or five of us over here, makes us quite important in our sphere of influence and work.

"Necessity made it possible for me to get a rating of Staff Sergeant and every effort is being made to get me to withdraw my accepted o.c.s. ordnance papers . . . but did not do it. Three months ago I managed to get into ordnance o.c.s. and am waiting to leave in the near future, maybe back to America for training.

"Was on an Eagle Club Radio broadcast to the World in February and was questioned about my work and I really 'poured-it-on' and my folks did hear me, *what a thrill!* The general staff officer, a Major, asked me what I thought about the visual care of the men, and what the optometrists were doing. I certainly explained it in detail. He seemed to be very interested.

"A few medical men here are training enlisted men in doing refractions without the retinoscope . . . boy what won't they do in time of necessity! We have complete control here unofficially on the refraction element but they make sure nothing goes on their permanent work records that an optometrist examined the cases. I have tried it and got my ears knocked down. In one case (man up for reclassification)—boy was the Captain bawled out because I wrote, 'In the opinion of the consulting refractionist (optometrist), etc.' I can imagine how it stung in higher headquarters. Letters of protest should be sent through military channels to legislative war department bodies . . . male nurses are doing it. You might also write to the Surgeon General's office telling them of conditions and making recommendations to other legislative war department bodies about proper recognition for optometrists. Letters going through channels go through many top kick hands and eventually to the Surgeon General or other war department bodies. That could be rather helpful. I suggest that our organizations construct the letters. In these the theme should be well clarified, then mail them to the optometrists asking them to send them through channels . . . they couldn't refuse, that I know. It's a good point and if enough go through, it will help correct this situation.

"You people are foolish if you try to get the ophthalmologists to recommend us for a commissional rank; they just won't do it and that isn't a joke. The English eye men definitely oppose us, and have heard from reliable sources that Vail has been strongly criticized for allowing us to refract . . . incidentally, Rider, Lister, Parsons have refracting opticians working with them on occasional refractions—the patient getting half-hour service . . . but few are refracted in the English Army.

"Don't waste time trying to create a commissional corps in time of war, settle with warrant officer ratings but nothing less. I understand from my o.c.s. board that optometrists are playing a good part in ordnance optical work. Know of some shave-tails here that are not doing anything too interesting but I let them occasionally bring men in to refract and the Captain doesn't object.

"Barstow, Hutchinson, Goodman, Ketchum and other leading California optometrists know the problems well over here on which I shan't take time to

elaborate. These are spectacular without giving any further M.D. angles. Ocular care is as important as dental and anything else. The question of being able to do the work no longer enters into consideration, it's a political question which must be settled. If attacked right, with proper political pressure, it can be won.

"Am well known around my area by the medics and chief surgeon's office . . . many, many medics have talked with me to remain here—I'll grant that the experience is interesting but really doing retinoscopy and pathology and etc. gets quite boring when you can't and don't have time to follow your cases. One doesn't get too much optometric practice, with some excellent surgical and medical practice.

"The s/sgt. optician, in charge of all prescriptions in Eto is a former Continental Optical Company salesman; very interesting, he, too, is fighting for optometric recognition. Hope something progressive is accomplished soon."

This letter illustrates the unsound position forced upon optometrists by the Chiefs of the Medical Corps of the United States Army. Here we see optometrists attempting to leave their chosen field of ocular work because of the tyranny of a small group of Army medical men. Optometrists who are willing to fight for liberty are accorded none in their own Army life; and in an army that needs their services. The entire matter is so strange and unusual that it could only happen to a profession momentarily lacking in real leadership.

Now there is an answer to this problem, and something should now be done about the matter. To wait until the war is won is to continue to subject the members of our profession to the humiliation already heaped upon them, and in this we cannot continue—because we are part of that group of optometrists who had a part in waging our early fights for proper and adequate legislation, and those fights were not won by sitting idly by, hopefully waiting for something pleasant to happen.

These were fights in every sense of the word, and we won them because our cause was just and the right was on our side. We won them also by fighting hard and fearlessly against all odds. There was never a moment of let-down and never a pause until our objectives had been taken. The same fine job can and must be done today. We quote from a California editorial:[1]

"Optometry has for many years enjoyed a very favorable position in the legislature in California because we have taken the time and trouble to bring before the legislators the problems and the work of optometry. We have given evidence of the fact that we are serving the public and are doing out part in the protection of public health.

"This procedure has been very successful in California and certainly could be used by the National officers in the handling of our National problems. To date optometry has not received very favorable consideration by the National government . . . For too long we have been sitting back, doing nothing, or at least very little, towards acquainting our congressmen about optometry . . . Optometry has failed and our National officers have failed because they have not attempted to

[1]Editorial. The California Optometrist. Vol. 11, No. 5, p. 1, 1942.

reach the right people—the men that represent the rank and file of the public—the men that represent the individual optometrist. The congressmen are interested in what the voters think, in their problems and needs.

"This is one way that optometry can get places a lot better and quicker than by attempting to argue with a lot of bureaucratic officers who are biased and controlled. Let us quit playing around and get busy with a program that will produce real results."

To correct this situation, good legal counsel must be secured. A legislative bill dealing with optometric service in the United States Army must be drafted after careful study. This bill must then be introduced in both the United States Senate and the House. It can be done. Optometry has many friends. These will see the justice of our position. Once started, every optometrist must then contact his or her Senator or Congressman. The facts of our case must be presented and their pledge secured to pass the bill.

Optometry today is in a strong position to do this very thing. The United States Army officials are prepared to react to this type of action, and a united optometry can now win this fight and give optometrists in our Army the position and rank which is their just due. These men deserve our backing and have every right to criticise us for failing them during the past year. The time to act is now. As optometrists we can no longer evade the issue. CAREL C. KOCH.

SPECIAL REPORTS

REPORT ON SAFETY GOGGLE PROBLEM*

A. C. Holland, Opt.D.
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At the request of the Board of Trustees of the American Optometric Association, Dr. Richardson and I stopped in Chicago to try to discover what consideration was being given by the National Safety Congress to the prescription safety goggle problem.

We first visited Mr. Roy Wetmore at the Riggs Optical Company and asked him whether or not his organization had arrived at a decision on policy in this field. He stated that they had not yet arrived at a final answer but were working on a plan. We projected the thought that there were at least three groups vitally interested, and that consultation of the

*California Optometrist. Vol. 11, No. 5, p. 10, 1942.

three would be desirable before major decisions were reached by any one group. Those three are, the professions, the manufacturers of ophthalmic materials, and the industrial plants and their employees. We asked him if it might not be a good idea for these groups to meet through duly appointed representatives and to formulate a plan that would work for the good of all. Mr. Wetmore expressed himself as favorable to such an idea, but said that they were not ready yet on their policy.

We then met with Drs. P. W. Peterson and Carl Shepard of the American Optometric Association Industrial Committee. They have been in close contact with the whole picture and also the research work being done at Purdue University under Dr. Tiffin. This work, as you know, is a joint project of ophthalmology, optometry, Bausch & Lomb, and Purdue. They are on the verge of presenting some plan and within a short time some of the investigations and resultant instruments will be completed. They feel that the better plan is to submit our program to the industrial engineers through the Personnel Department rather than through the Safety Department. This is predicated upon the belief that the plan will eventually include some form of placement study (which words are far more acceptable to unions than the words, "Screening Tests"). Purdue is planning a course for industrial engineers which will lead to a Master's Degree, and the graduates of such a course will in the end become the heads of the Personnel Departments, and other universities will follow Purdue.

We then visited the exhibits[1] at the Sherman Hotel. Prominent among them were displays from the Safety Departments of the American Optical Company and Bausch & Lomb Company. There were also displays by about five other manufacturers of safety goggles, and the Keystone Company. One could not help but notice that instructions were apparently being given by exhibitors as to how to determine the pupillary distance, the size of frame, the height of segment, and type and color of lens. In view of the information given by the Industrial Committee, we made no attempt to contact anyone in authority at the Safety Council. Our conclusions are:

1. Industrial prescription goggles are important in industry now and are growing increasingly.
2. Optometry must chart its course carefully in this field.

[1]National Safety Congress at Chicago, October, 1942.

3. Our scope of activity in this field must be well defined and vigorously protected.
4. Industrial plants will insist on making placement tests under their own supervision.
5. That the industry will supply goggles and corrective hardened lenses to their employees at minimum cost through their own purchasing departments.
6. In order to remove prejudices against goggles, industry is making a drive to put glasses and goggles on all employees.
7. In order to protect themselves against government paternalism (i.e., socialism or communism), industrial management is supplying everything they can think of, including goggles and glasses to employees.
8. Optometrists must increasingly derive their income from fees for services rendered in the examination, prescribing, fitting, and adjusting of therapeutic ophthalmic devices and visual training, and may eventually even be faced with the complete loss of any income or profit from goggles as such.
9. That Optometrists must give careful consideration to the patient's working distance when prescribing, and must do a better job than ever done before.
10. Optometry should have a representative at all such Safety Congresses.
11. That we recommend that all Associations adopt a uniform plan for the handling of industrial goggles.

a. That industrial goggles be furnished by the supply houses as in the past, with the following changes in the manner of distribution.

b. That prescription goggles be delivered by the registered refractionist to employees on order from the industrial plant, and that prescription goggles be delivered to the office of the licensed examiner writing the prescription for checking and dispensing.

c. Goggles be billed to the industrial plants as is the present practice.

d. That Optometrists collect their fees for services rendered the employee, where no other arrangement is made by the industrial plant.

DESIGNATION OF VISUAL ACUITY*

Ophthalmologists are accustomed to designate their findings on visual acuity by referring to a standard distance (for instance, 20/50, 20/80). On the other hand, it seems that in all tests given by the military services, a standard size letter is used and the examinee has to approach this letter until he is able to read it. Therefore, the official designations of visual acuity for the military services read 12/20, 15/20, etc.

Examiners may have difficulty in comparing these two different kinds of designations. There is a simple way of conversion, by dividing the figure one wants to convert into 400. For instance: 20/25 of the ophthalmologist's designation equals 16/20 (400 divided by 25 equals 16), and 12/20 of the military services' designation equals 20/33 (400 divided by 12 equals 33).

*Archives of Ophthalmology, April, 1943, p. 662.

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TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

by J. Fred Andreae, Secretary

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

PROGRAM OF AMERICAN ACADEMY OF OPTOMETRY'S PROFESSIONAL ADVANCEMENT

Dedicated to All Members of the Optometric Profession

Synopsis of A Revised Academy Program

A more complete plan will be presented when details have been completed.

Motive:

(1) The value of any integral society can be measured in terms of the extent of its service toward the betterment of its parent profession, and

(2) The enhancement through precept, influence and education, of the technical abilities and practice standards of the members of its own

society which membership will grow as the result of such service.

The Academy's Interest:

I. High Standards of Ethical and Professional Practice to which the Academy is Dedicated in Principal as well as in Practice. The Program Will Include the Following:

Educational campaign
Articles for publication
Lectures
Personal contacts
Advice and guidance

II. Optometric College Student Procurement With the Purpose of Seeking to Interest Candidates in Optometry as a Career and to Use Guardianship Over Such Recruits Which Will Tend to Influence and Direct Them Into Such Coveted Standards of Practice.

Educational Material to Students
Educational Material to Teachers of Vocations
Speakers Bureau

DR. D. R. PAINE,
COMMITTEE CHAIRMAN,
AMERICAN ACADEMY OF OPTOMETRY

BOOK NOTICES AND REVIEWS

Books received are acknowledged by notices in this department. Special selections will be made for more extensive review in the interest of our readers as space permits.

A HANDBOOK OF MEDICAL LIBRARY PRACTICE. Janet Doe, Editor. Published by the American Library Association, Chicago, Ill. 640 pages. Cloth. $5. 1943.

After three years of cooperative effort, a special committee of the Medical Library Association witnessed on June 1 the appearance of its *Handbook of Medical Library Practice*. Under a special arrangement with the M. L. A. the American Library Association has published this important new manual—a book which brings to medical librarians their first comprehensive treatise on practice and operations in their field.

The *Handbook* is based on preliminary manuscript written a num-

ber of years ago by Miss M. Irene Jones of the Detroit Public Library. Around the nucleus of the Jones manuscript, the M. L. A. "Committee on a Library Handbook" built its manual, each member contributing a chapter on his specialty in medical library practice. The separate parts are knit into a balanced whole by Editor Janet Doe, who is the assistant librarian at the New York Academy of Medicine.

The book is both a manual of procedure and a reservoir of useful data. "It is an attempt to imitate ontogeny by recapitulating in one volume the experience of the race of medical librarians," says the Introduction; it acquaints the general librarian with the special problems of the medical library. Accompanying the chapters on procedures are appendices which have brought together extensive bibliographies, lists, and guides.

In Chapter VIII, an *Annotated List of Reference Books* includes 625 items, carefully described, and provides the blueprint for building the foundation of any medical library that is to attempt reference service. This important guide covers 165 pages and alone is a significant contribution to medical librarianship. There are also lists of medical libraries here and abroad; the principal expansions of medical classification schemes; a guide to bibliographies, bibliographic collections, and histories useful in historical medical collections.

The principal chapters cover medical library administration, selection and ordering of books and periodicals, cataloging, subject headings, classification, pamphlets, pictures, maps, microfilms, reference work, rare books and the history of medicine.

In order to keep the price within the reach of all who might make use of the manual, the Medical Library Association has heavily subsidized its publication.

ABSTRACTS

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list, although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

11. EDUCATION, SOCIOLOGY AND ECONOMICS

THE CULTURES OF DEMOCRACY. H. M. Kallen. Journal of Educational Sociology. 1943, 16, 6, 329-332.

"An educated man is distinguished from an ignoramus, a tolerent man from an intolerant, a man of culture from a barbarian, and a free man from a servile one by his desire for and training in free communication with the different. Among free men, the entire purpose of education is mastery of the means and methods of free communication. Such a mastery is, and always has been, culture; and it measures any person's readiness to live and to grow in a civilization that is naturally a cultural pluralism and that takes the fact of this pluralism as the basic material of its cultural ideal." L. P.

PRESENT TRENDS TO SOCIALIZED MEDICINE. L. F. Raymond. Optometric Weekly. 1943, 33, 5, 1421-1433.

The author reviews the practice of socialized medicine in various foreign countries and points out that this form of health service will probably develop here. He believes that funds for this purpose will be raised through increased taxation of the workers by means of the Social Security Payroll Deduction. The professional men will be compensated on a per-visit basis; doctors and other health personnel will be divided into sections or panels in their respective localities. For example, if anyone were to become ill, he would contact his local health administrator. The patient can then select a doctor listed in his locality. In this system the patient would be insured of free choice of physician. The doctor, after treating the patient, would be compelled to make a record on a form provided by the Health Administrator. Compensation would be received from the local health office.

He claims that the facts are quite apparent that socialization of

medical services will be upon us in the very near future in order to insure two of the four freedoms as discussed in the "Atlantic Charter," namely —freedom from want; and freedom from fear. Socialized health services seem to be the answer. T. O. B.

GENERAL MAXIMUM PRICE REGULATION. H. Kohn. Associated Journal of Optometry. 1943, 8, 4, 10.

The Office of Price Administration has ruled that where the optometrist, oculist or ophthalmologist makes one complete charge for both his refractive services and the ophthalmic material he prescribes for his patient that this one complete charge is subject to the General Maximum Price Regulation.

If, on the other hand, the refractionist makes the examination and refraction and does not, as part of the same transaction either directly or indirectly, dispense the ophthalmic materials required, the professional fees for such services do not come under the General Maximum Price Regulation.

If the optometrist, oculist or ophthalmologist, prior to and during March, 1942, made a separate charge for his services and a separate charge for the ophthalmic materials prescribed for the patient, then the charge for the services is not subject to the General Maximum Price Regulations, whereas the charge for the ophthalmic materials remains subject to them.

Refractionists who up to March, 1942, did not separate these charges but who now may wish to do so are permitted to separate them, provided that the total of the two charges or fees is not greater than the combined charge or fee received by the refractionist for similar services and materials in March, 1942. C. C. K.

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12. MISCELLANEOUS

OPHTHALMOLOGY IN MEDICAL DIAGNOSIS. D. Alperin. Eye, Ear, Nose and Throat Monthly. 1943, 22, 1, 15-19.

The general practitioner should have a working knowledge of all branches of medicine for a more comprehensive clinical sense. He will realize that there is wide and intimate contact between medicine in general and the specialties. These should not be only tolerated but consulted for intelligent diagnosis. On the other hand the relatively circumscribed

point of view that goes with detailed efficiency of specialization frequently needs the complementary function of general medicine and the internist. The internist should have an encyclopedic knowledge of fundamentals, and a discriminating judgment in the face of important details. With this obligation goes the rewarding privilege of a broad point of view and congenial relationship with those whose primary interest is in a smaller sphere, yet whose detailed knowledge and skillful technic makes such contact profitable.

The study of ophthalmology constitutes the best discipline in exact observation; absolute precision is of first importance, diagnostic skill and surgical dexterity a prerequisite. It affords a great aid to methods of investigation of medical problems in general and of the nervous system in particular.

The greatest stimulus which medicine in general, and ophthalmology in particular has ever known, was, when Babbage, in England, introduced the ophthalmoscope in the middle of the last century. The ease with which the eye lends itself to the examination, has made ophthalmology the most exact of the branches of medicine. Elsewhere in the body the clinician reasons by inference, in ophthalmology he can observe pathologic processes directly as they occur in the living tissue.

A. V. F.

EYE DEFECTS DISCOVERED THROUGH SELECTIVE SERVICE EXAMINATIONS. A. E. Town. Sight Saving Review. 1941, 11, 4, 269-275.

The requirements of eyesight by the army and navy are necessarily rigid and many men are kept out of the service who would be valuable and willing soldiers. Comparisons between the current draft statistics and those of the last war are bound to be erroneous because the standards of physical and mental selection are much more rigid today. Furthermore, our present-day methods of diagnosis are superior and the government is seeking to bar potential as well as obvious misfits from the army now in training.

Many physicians believe that some of the reasons for deferment are inconsequential from the practical viewpoint and that men are being rejected who could prove useful in occupations requiring limited physical activity. This is, of course, for the army to decide, but it is safe to say that many of those refused as physically unfit are reasonably healthy by

ordinary civilian standards and capable of fulfilling the social and economic demands of normal life.

There has, it is true, been a substantial per cent of rejections because of physical deficiencies which cannot be dismissed as unimportant, and regardless of the efficacy of a health program, it could not banish many congenital deformities and traumatic defects for which reparative procedures have not yet been devised.

A summary of defects among men drafted in the World War of 1917-18, as issued by the U. S. Public Health Service recently, indicated that 21 per cent of the men examined were rejected for any military service and an additional 10 per cent were accepted for limited service only. Corresponding figures for men examined under the Selective Service Act of 1940, indicate that 28 per cent were not qualified for any military service and an additional 15 per cent were qualified for limited service only. Of this total was the group who failed to meet the requirements in vision (5.03 per cent did not qualify for general military service, about half of whom were not qualified for any military service whatever). This compares with 5.3 per cent not qualified for general military service among drafted men in1917-18. T. O. B.

OPTOMETRY IN THE UNITED STATES NAVY. S. L. Fast. Journal of the American Optometric Association. 1942, 14, 2, 47-51.

The author, an optometrist, is a Lt. (j.g.) in the U. S. Navy. He describes his activities as a naval refractionist as follows:

"The domain of the optometrist is that portion of the eye-room containing the refracting equipment. One or more enlisted men of the hospital corps serve as general assistants in the office.

"In addition to the work with recruits, the optometrist's work includes the following:

"1. Refractions and recommendations for officers and men—members of the station crew, or referrals from other stations and ships.

"2. Refractions of candidates for enlistment or commission, referred from the local recruiting office. These applicants generally do not have 20/20 visual acuity in both eyes, and the recruiting officer must know whether they are capable of correction to that norm.

"3. Assistance in the eye examination portion of Civil Service physical examinations for civilian jobs on the Naval Base. These routine tests include visual acuity—uncorrected and corrected, range of ac-

commodation on Jaeger type, uncorrected and corrected, external eye inspection and color vision test.

"4. Assistance in the eye portion of Navy physical examinations given to candidates for commission, officers being called to active duty, annual tests and examinations for promotion. This comprises visual acuity and refractive findings eliciting 20/20 acuity, external eye inspection with emphasis on pupillary reflexes, ophthalmoscopic search and color vision

"In the main, men in the Navy presenting themselves to the optometrist will exhibit the same ocular anomalies as those visiting the civilian optometrist. However, since the man who goes to sea has particularly stringent visual tasks, the emphasis must be on visual acuity."

L. P.

AVIATION OPTHALMOLOGY. C. E. Gillespie. Eye, Ear, Nose and Throat Monthly. 1942, 21, 9, 274.

Qualifications of trainees include first, a very thorough physical examination to eliminate those who do not rate high in physical endowment. Second, there is a very complete and painstaking neuropsychiatric examination to eliminate all the mental and nervous weaklings, including temperamental and personality handicapped individuals. Third, psychological tests, both subjective and objective, rating or actually measuring when possible those traits or abilities which appear to be involved in learning to fly a military airplane, that is classifying our trainees in terms of native flying ability. It is by the combination of these methods that the applicant's potentialities can best be determined and from the standpoint of approach and evaluation they loom highest in the armamentarium of the flight surgeon.

L. P.

GLAUCOMA DEMONSTRATION PROJECT. Special Report. Eye Health and Safety News. 1943, 1, 1, 2.

The National Society for the Prevention of Blindness claims their program for the prevention of blindness from glaucoma is making headway. A demonstration glaucoma clinic has been organized at Manhattan Eye, Ear and Throat Hospital, New York City. Volunteers who were trained to carry on certain phases of examinations of glaucoma patients are assisting in this clinic under the close supervision of ophthal-

mologists. Through the employment of a trained perimetrist for this clinic, the NSPB is offering similar training to five additional volunteers recommended for such training by chiefs of eye clinics of three hospitals in New York City. A. V. F.

INDUSTRIAL VISUAL WORK. J. R. Wittekind. Optometric Weekly. 1942, 33, 44, 1228-1229.

The author suggests, from a background of practical experience in the field, the following examination routine for industrial eye work by optometrists:

(1) Case history
(2) External ocular inspection.
(3) Ophthalmoscopic examination.
(4) Ophthalmometric examination.
(5) Objective and subjective refractive tests.
(6) Ocular muscle tests to determine coordination.
(7) Accommodative amplitude tests.
(8) Tests for fusion.
(9) Color vision tests, and
(10) Tests to determine the extent of the field of vision.

C. C. K.

SIGHT CONSERVATION ON THE ADVANCING FRONTS OF PUBLIC HEALTH AND NUTRITION. F. G. Boudreau. Sight Saving Review. 1941, 11, 4, 259-267.

"The greatest influence which is being brought to bear on the public health front is this attempt to push back the frontiers of disease by measures or methods of detecting and correcting early deviations from vigorous health. The chief health problem is no longer the prevention of fully developed disease. Our task is to determine *why* so large a proportion of our people fail to develop and maintain the vigorous health characteristic of selected classes. Translating this task into the responsibilities which will be assumed in future by the National Society for the Prevention of Blindness, I can see your emphasis shifting more and more from prevention to conservation, as indeed it has been doing in the last few years. Conservation of vision in the modern sense of the term will call for talents and energies never needed in the simpler tasks of the past." T. O. B.

HELPING AMERICA BY SAVING SIGHT IN CHILDHOOD. THROUGH THE HEALTH SERVICES. Heering, R. E. Sight-Saving Review. 1941, 11, 3, 179-189.

"The author presents the responsibility of official and voluntary health agencies in the conservation of vision movement and points out what has already been accomplished through health services." L. P.

A STEP TOWARDS PROFESSIONALISM. Fisher, H. M. Bulletin of the Optometrical Society of the City of New York. 1941, 7, 1, 9-10.

"It does not serve public welfare for a man to hold himself out to be an optometrist and an optician." Fisher advocates taking vigorous steps to kill forever the already dying practice of optometrists filling ocular prescriptions other than their own. C. C. K.

MEDICAL PLANNING COMMISSION'S REPORT. (Special Report). Optician. (London). 1942, 103, 2674, 349.

Whole-time salaried medical service under Government direction is rejected in the interim report of the Medical Planning Commission set up by the British Medical Association. Instead the Commission suggests the establishment of a central authority to be concerned solely with all civilian health problems. The report also proposes the establishment of model health centers, at which group or co-operative general medical practice would be the rule. Specialist or consultant services would also be provided to all persons within prescribed income limits. L. P.

THE EYE AS AN INDEX OF EXPRESSION. J. D. Spooner. Dioptric Review and British Journal of Physiological Optics. (London). 1942. New Series. 2, 3, 169-176.

This is a short essay in which the author describes the part played by the eyes, lids and orbits in expressing emotions. His study of the subject leads him to believe that ocular-facial expression is accomplished through the joint efforts of thirteen variable facial lines all located around the eye; three ocular reflections, and the contour of ten major ocular-facial

areas adjacent to the eyes. An ingenious chart illustrating the position of these is also presented. C. C. K.

UNORTHODOX OCULAR TREATMENTS. W. R. Challis. Dioptric Review and British Journal of Physiological Optics. (London). 1942. New Series. 2, 3, 186-192.

The following osteopathic claims are presented. (1) A change in refraction usually follows a course of general osteopathic manipulation and the tendency is towards reduction in amount of error and a marked increase in visual acuity. (2) Correction of squint by removing spinal lesions. (3) Retarding presbyopia by general manipulative treatment. (4) The correction of early cataract by treating a dorsal lesion, and (5) the manipulative treatment of early glaucoma. L. P.

OPHTHALMOLOGIC AND OPTOMETRIC COLLABORATION IN THE NATIONAL WAR EFFORT. R. G. Moore. Pennsylvania Optometrist. 1942, 11, 1, 53.

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ANISEIKONIA. HISTORY OF RESEARCH, SYMPTOMS AND IMPORTANCE OF STUDYING IT. Arene T. Wray. Western Optical World. 1943, 31, 1, 15-17.

Wray presents a review of the ocular research done at Dartmouth Eye Institute, also presenting an historical background for the development of this institution. A. V. F.

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